

ARIZONA CTE CAREER PREPARATION STANDARDS & MEASUREMENT CRITERIA**DIESEL ENGINE REPAIR, 47.0600.40****STANDARD 1.0 PERFORM GENERAL ELECTRICAL SYSTEM DIAGNOSIS AND REPAIR**

1.1	Read and interpret electrical/electronic circuits using wiring diagrams
1.2	Check continuity in electrical/electronic circuits using appropriate test equipment
1.3	Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment
1.4	Check current flow in electrical/electronic circuits and components using appropriate test equipment
1.5	Check resistance in electrical/electronic circuits and components using appropriate test equipment
1.6	Locate shorts, grounds, and opens in electrical/electronic circuits
1.7	Identify parasitic (key-off) battery drain problems; perform tests; determine needed action
1.8	Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed
1.9	Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment

STANDARD 2.0 PERFORM BATTERY DIAGNOSIS AND REPAIR

2.1	Perform battery load test; determine needed action
2.2	Determine battery state of charge using an open circuit voltage test
2.3	Inspect, clean, and service battery; replace as needed
2.4	Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed
2.5	Charge battery using slow or fast charge method as appropriate
2.6	Inspect, test, and clean battery cables and connectors; repair or replace as needed
2.7	Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures

STANDARD 3.0 PERFORM STARTING SYSTEM DIAGNOSIS AND REPAIR

3.1	Perform starter circuit cranking voltage and voltage drop tests; determine needed action
3.2	Inspect and test components (key switch, push button and/or magnetic switch) and wires in the starter control circuit; replace as needed
3.3	Inspect and test, starter relays and solenoids/switches; replace as needed
3.4	Remove and replace starter; inspect flywheel ring gear or flex plate

ARIZONA CTE CAREER PREPARATION STANDARDS & MEASUREMENT CRITERIA**STANDARD 4.0 PERFORM CHARGING SYSTEM DIAGNOSIS AND REPAIR**

4.1	Test instrument panel mounted volt meters and/or indicator lamps; determine needed action
4.2	Identify causes of a no charge, low charge, or overcharge problems; determine needed action
4.3	Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment
4.4	Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action
4.5	Perform charging circuit voltage drop tests; determine needed action
4.6	Remove and replace alternator
4.7	Inspect, repair, or replace cables, wires, and connectors in the charging circuit

STANDARD 5.0 PERFORM LIGHTING SYSTEM DIAGNOSIS AND REPAIR

5.1	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action
5.2	Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation
5.3	Test, aim, and replace headlights
5.4	Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed
5.5	Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed
5.6	Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed
5.7	Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed
5.8	Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed
5.9	Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed
5.10	Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed

STANDARD 6.0 PERFORM GAUGES AND WARNING DEVICES DIAGNOSIS AND REPAIR

6.1	Interface with vehicle's on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action
6.2	Identify causes of intermittent, high, low, or no gauge readings; determine needed action
6.3	Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed
6.4	Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed

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STANDARD 7.0 PERFORM RELATED ELECTRICAL SYSTEMS DIAGNOSIS AND REPAIR	
7.1	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action
7.2	Identify causes of constant, intermittent, or no horn operation; determine needed action
7.3	Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed
7.4	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed
7.5	Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed
7.6	Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed
7.7	Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed
7.8	Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed
7.9	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed
7.10	Identify causes of slow, intermittent, or no power side window operation; determine needed action
7.11	Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed
7.12	Inspect and test block heaters; determine needed repairs
7.13	Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits
7.14	Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed
STANDARD 8.0 PERFORM ENGINE SYSTEM PM	
8.1	Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm
8.2	Inspect vibration damper
8.3	Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment
8.4	Check engine oil level and condition; check dipstick seal
8.5	Inspect engine mounts for looseness and deterioration
8.6	Check engine for oil, coolant, air, fuel, and exhaust leaks (Engine Off and Running)
8.7	Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing

ARIZONA CTE CAREER PREPARATION STANDARDS & MEASUREMENT CRITERIA**STANDARD 9.0 PERFORM FUEL SYSTEM PM**

9.1	Check fuel tanks, mountings, lines, caps, and vents
9.2	Drain water from fuel system
9.3	Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system

STANDARD 10.0 PERFORM AIR INDUCTION AND EXHAUST SYSTEM PM

10.1	Check exhaust system mountings for looseness and damage
10.2	Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after treatment devices, if equipped
10.3	Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks
10.4	Inspect turbocharger for leaks; check mountings and connections
10.5	Check operation of engine compression/exhaust brake
10.6	Service or replace air filter as needed; check and reset air filter restriction indicator
10.7	Inspect and service crankcase ventilation system

STANDARD 11.0 PERFORM COOLING SYSTEM PM

11.1	Check operation of fan clutch
11.2	Inspect radiator (including air flow restriction, leaks, and damage) and mountings
11.3	Inspect fan assembly and shroud
11.4	Pressure test cooling system and radiator cap
11.5	Inspect coolant hoses and clamps
11.6	Inspect coolant recovery system
11.7	Check coolant for contamination, additive package concentration, and protection level (freeze point)
11.8	Service coolant filter
11.9	Inspect water pump for leaks and bearing play

STANDARD 12.0 PERFORM LUBRICATION SYSTEM PM

12.1	Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs
12.2	Take an engine oil sample

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STANDARD 13.0 PERFORM INSTRUMENTS AND CONTROLS PM

13.1	Inspect key condition and operation of ignition switch
13.2	Check warning indicators
13.3	Check instruments; record oil pressure and system voltage
13.4	Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable)
13.5	Check HVAC controls
13.6	Check operation of all accessories
13.7	Using diagnostic tool or on-board diagnostic system; retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, ABS, and other systems)

STANDARD 14.0 PERFORM SAFETY EQUIPMENT PM

14.1	Check operation of electric/air horns and reverse warning devices
14.2	Check condition of spare fuses, triangles, fire extinguisher, and all required decals
14.3	Inspect seat belts and sleeper restraints
14.4	Inspect wiper blades and arms

STANDARD 15.0 PERFORM CAB HARDWARE PM

15.1	Check operation of wiper and washer
15.2	Inspect windshield glass for cracks or discoloration; check sun visor
15.3	Check seat condition, operation, and mounting
15.4	Check door glass and window operation
15.5	Inspect steps and grab handles
15.6	Inspect mirrors, mountings, brackets, and glass
15.7	Record all observed physical damage
15.8	Lubricate all cab and hood grease fittings
15.9	Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables
15.10	Inspect cab mountings, hinges, latches, linkages and ride height; service as needed

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STANDARD 16.0 PERFORM HEATING, VENTILATION, & AIR CONDITIONING (HVAC) SYSTEM PM	
16.1	Inspect A/C condenser and lines for condition and visible leaks; check mountings
16.2	Inspect A/C compressor and lines for condition and visible leaks; check mountings
16.3	Check A/C system condition and operation; check A/C monitoring system, if applicable
16.4	Check HVAC air inlet filters and ducts; service as needed
STANDARD 17.0 PERFORM BATTERY AND STARTING SYSTEM PM	
17.1	Inspect battery box(es), cover(s), and mountings
17.2	Inspect battery hold-downs, connections, cables, and cable routing; service as needed
17.3	Check/record battery state-of-charge (open circuit voltage) and condition.
17.4	Perform battery test (load and/or capacitance)
17.5	Inspect starter, mounting, and connections
17.6	Engage starter; check for unusual noises, starter drag, and starting difficulty
STANDARD 18.0 PERFORM CHARGING SYSTEM PM	
18.1	Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action
18.2	Perform alternator output tests
STANDARD 19.0 PERFORM LIGHTING SYSTEM PM	
19.1	Check operation of interior lights; determine needed action
19.2	Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action
19.3	Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action
STANDARD 20.0 PERFORM AIR BRAKE SYSTEM PM	
20.1	Check operation of parking brake
20.2	Record air governor cut-out setting (psi)
20.3	Check operation of air reservoir/tank drain valves
20.4	Check air system for leaks (brakes released)
20.5	Check air system for leaks (brakes applied)

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20.6	Test one-way and double-check valves
20.7	Check low air pressure warning devices
20.8	Check air governor cut-in pressure
20.9	Check emergency (spring) brake control/modulator valve, if applicable
20.10	Check tractor protection valve
20.11	Test air pressure build-up time
20.12	Inspect coupling air lines, holders, and glad hands
20.13	Check brake chambers and air lines for secure mounting and damage
20.14	Check operation of air drier
20.15	Inspect and record brake shoe/pad condition, thickness, and contamination
20.16	Inspect and record condition of brake drums/rotors
20.17	Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing
20.18	Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke
20.19	Lubricate all brake component grease fittings
20.20	Check condition and operation of hand brake (trailer) control valve
20.21	Perform antilock brake system (ABS) operational system self-test
20.22	Drain air tanks and check for contamination
20.23	Check condition of pressure relief (safety) valves
STANDARD 21.0 PERFORM HYDRAULIC BRAKE SYSTEM PM	
21.1	Check master cylinder fluid level and condition
21.2	Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage
21.3	Check parking brake operation; inspect parking brake application and holding devices; adjust as needed
21.4	Check operation of hydraulic system: pedal travel, pedal effort, pedal feel (drift)
21.5	Inspect calipers for leakage and damage
21.6	Inspect brake assist system (booster), hoses and control valves; check reservoir fluid level and condition

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21.7	Inspect and record brake lining/pad condition, thickness, and contamination
21.8	Inspect and record condition of brake rotors
21.9	Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing
STANDARD 22.0 PERFORM DRIVE TRAIN PM	
22.1	Check operation of clutch, clutch brake, and gearshift
22.2	Check clutch linkage/cable for looseness or binding, if applicable
22.3	Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable
22.4	Check clutch adjustment; adjust as needed
22.5	Check transmission case, seals, filter, hoses, and cooler for cracks and leaks
22.6	Inspect transmission breather
22.7	Inspect transmission mounts
22.8	Check transmission oil level, type, and condition
22.9	Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing
22.10	Inspect axle housing(s) for cracks and leaks
22.11	Inspect axle breather(s)
22.12	Lubricate all drive train grease fittings
22.13	Check drive axle(s) oil level, type, and condition
22.14	Change drive axle(s) oil and filter; check and clean magnetic plugs
22.15	Check transmission wiring, connectors, seals, and harnesses for damage and proper routing
22.16	Change transmission oil and filter; check and clean magnetic plugs
22.17	Check interaxle differential lock operation
22.18	Check range shift operation
STANDARD 23.0 PERFORM SUSPENSION AND STEERING SYSTEMS PM	
23.1	Check steering wheel operation for free play or binding
23.2	Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level

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23.3	Change power steering fluid and filter
23.4	Inspect steering gear for leaks and secure mounting
23.5	Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages
23.6	Check kingpin for wear
23.7	Check wheel bearings for looseness and noise
23.8	Check oil level and condition in all non-drive hubs; check for leaks
23.9	Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators
23.10	Inspect shock absorbers for leaks and secure mounting
23.11	Inspect shock absorbers for leaks and secure mounting
23.12	Check and record suspension ride height
23.13	Lubricate all suspension and steering grease fittings
23.14	Check toe setting
23.15	Check tandem axle alignment and spacing
23.16	Check axle locating components (radius, torque, and/or track rods)
STANDARD 24.0 PERFORM TIRE AND WHEEL PM	
24.1	Inspect tires for wear patterns and proper mounting
24.2	Inspect tires for cuts, cracks, bulges, and sidewall damage
24.3	Inspect valve caps and stems; replace as needed
24.4	Measure and record tread depth; probe for imbedded debris
24.5	Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications
24.6	Check for loose lugs; check mounting hardware condition; service as needed
24.7	Retorque lugs in accordance with manufacturers' specifications
24.8	Inspect wheels for cracks or damage
24.9	Check tire matching (diameter and tread) on dual tire installations

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STANDARD 25.0 PERFORM FRAME AND FIFTH WHEEL PM	
25.1	Inspect fifth wheel mounting, bolts, air lines, and locks
25.2	Test operation of fifth wheel locking device; adjust if necessary
25.3	Check quarter fenders, mud flaps, and brackets
25.4	Check pintle hook assembly and mounting
25.5	Inspect frame and frame members for cracks and damage